

THE FREQUENCY DISTRIBUTION OF B CHROMOSOMES IN A SOUTH AFRICAN CULTIVAR OF THE SWEETCORN "GOLDEN BANTAM"

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ABSTRACT

The frequency distribution of B chromosomes in a South African cultivar of the sweet-corn "Golden Bantam" differs significantly from that described previously in this variety. The possible significance of this is discussed.

UITTREKSEL

DIE FREKWENSIEVERSPREIDING VAN B CHROMOSOME IN 'N SUID-AFRIKAANSE KULTIVAR VAN DIE SUIKERMIELIE „GOLDEN BANTAM"

Die frekwensieverspreiding van B chromosome in 'n Suid-Afrikaanse kultivar van die suikermielie „Golden Bantam" verskil betekenisvol van wat voorheen vir die variëteit beskryf is. Die moontlike betekenis word bespreek.

INTRODUCTION

The diploid karyotype of maize consists of a standard complement of 10 pairs of A chromosomes, together with a variable number of B chromosomes. The B's are typically subtelocentric (Carlson, 1978) and relatively constant in size, although more variable types were recorded by early workers (Darlington & Upcott, 1941). The B's are highly heterochromatic, are subject to polarised non-disjunction at the second pollen grain mitosis, and are boosted in frequency within populations by preferential fertilisation of the B-containing male gametes (Roman, 1948). The effects of the B's include enhanced recombination (Rhoades, 1978) and the induction of sticking of the heterochromatic "knobs" of the A chromosomes at the anaphase of the second meiotic division resulting in the elimination of segments from the latter (Rhoades and Dempsey, 1973). The presence of B chromosomes has been used to trace the patterns of migration of maize races (McClintock, 1978).

However, relatively little attention has been paid to the frequency distribution of B chromosomes within varieties. Randolph (quoted in Darlington & Upcott, 1941) studied this aspect in four commercial varieties, and found that in two ("HG Nugget" and "Golden Bantam") the most frequent category of individual was that with one B chromosome, whereas in two others ("NYS Flint"



FIG. 1.

Somatic metaphase of a plant of *Zea mays* var. "Golden Bantam" possessing no B chromosomes. "no" indicates nucleolar organiser chromosomes, bar represents 10 μ .

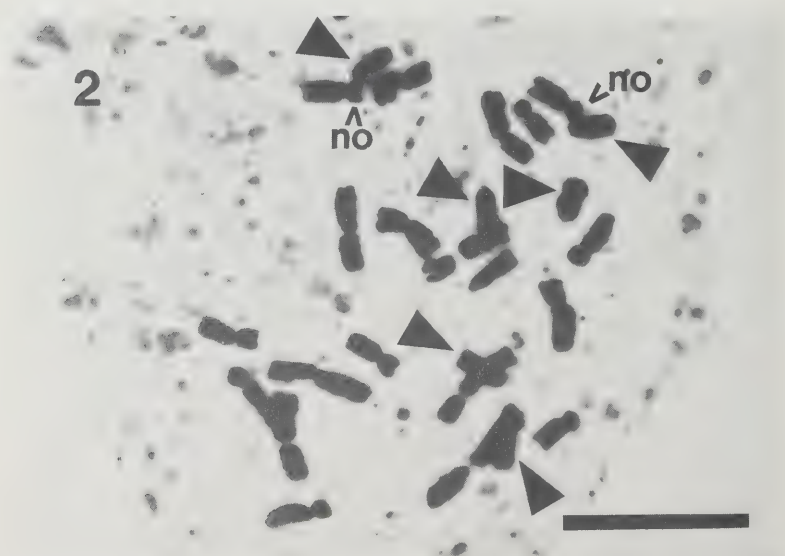


FIG. 2.

Somatic metaphase of a plant of *Zea mays* var. "Golden Bantam" possessing six B chromosomes (indicated by arrows). "no" indicates nucleolar organiser chromosomes, bar represents 10 μ .

and "Black Mexican") the most frequent categories were those with three and four B chromosomes respectively.

The present work consisted of a re-examination of B chromosome frequency in the variety "Golden Bantam", using a South African cultivar, to determine whether the frequency distribution in this cultivar differed from that described by Randolph.

MATERIAL AND METHODS

Seeds of the sweetcorn cultivar "Golden Bantam", obtained from MayFord Seeds (Johannesburg), were sown on moist filter paper in petri dishes at 24°C. Emergent radicles were pre-treated by incubation in a saturated aqueous solution of α -monobromonaphthalene for 4-5 hours at room temperature, and fixed in a 3:1 mixture of ethanol:glacial acetic acid overnight. The root tips were then hydrolysed in 1N HCl at 60°C for 6 minutes, softened by incubation in 5% aqueous cellulase for 2-3 hours, incubated in Schiff's reagent for 4-5 hours, and finally squashed in acetic orcein using an albumenised coverslip. The coverslip was then floated off in absolute ethanol, air-dried and mounted in Euparal.

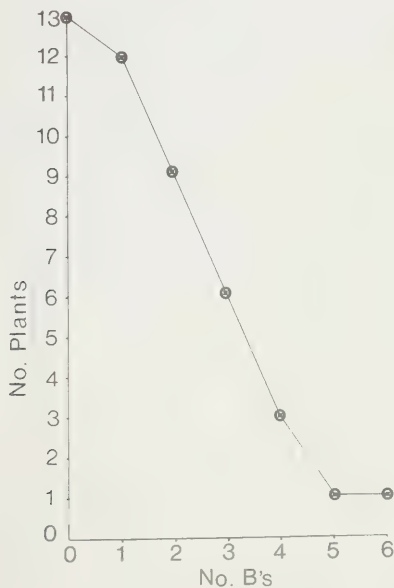


FIG. 3.
Frequency distribution of B chromosomes in the cultivar of *Zea mays* var. "Golden Bantam" studied.

RESULTS AND DISCUSSION

The cultivar was found to contain B chromosomes, which were of the normal subtelocentric type and which varied in number between plants from 0 to 6 (Figs 1, 2). The frequency distribution of B's constituted a curve of remarkable smoothness (Fig. 3), and differed from the previous result of Randolph in that the modal number of B's in the present case was nil rather than one.

It is therefore evident that the selective forces which maintain B chromosomes in maize do so in a manner which differs not only between varieties but also between different cultivars of the same variety. The work reaffirms that the frequency of B chromosomes is a selectively important element in the genetics of the variety, and emphasises that further breeding work on the variety could profitably include due consideration of their role.

ACKNOWLEDGEMENT

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